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Environmental Health Information Systems: More Than Just Gigabytes

Christopher R. Cook
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Environmental Health Information Systems:
More Than Just Gigabytes

Christopher R. Cook, R.S.
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Master of Public Health Program
Culminating Experience

September 14, 2007
Acknowledgements

To my wife, Jill...
I know you often wondered if I was married to you or the computer – but I promise it is you! Thank you for being patient and unconditionally supporting me – no matter what. You were truly my biggest fan.

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To my family...
Thank you for your never-ending support. None of my accomplishments would be possible without all of you.

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Your knowledge, experience, and friendship were invaluable. You were always ready to help me along the way. I greatly admire you and your accomplishments.

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Thank you for the continuous moral support – most often by email. Please thank Hannah and Eric for sharing you!

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The morning question about how my project was coming along meant more to me than you know. Thank you for your care and concern – not to mention picking up my slack along the way.

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You cannot put a price on the support, camaraderie, and life experiences you offered the past two years. I wish you nothing but the best.

To my co-workers at the Miami County Health District...
I cannot begin to count how many times you asked me how my classes were going! Your caring attitudes and daily smiles were appreciated.

To my baseball team, the Cleveland Indians...
Sure, they will never read this – but thank you for holding it all together while I was unable to listen to your games.
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Abstract

Environmental health professionals are concerned about bites. Animal bites, mosquito bites, and tick bites to name a few. But what about bytes of data? Environmental health information systems (EHIS) are often the “silent partners” in an environmental health (EH) department’s daily protection of public health. By Webster’s dictionary definition, a silent partner is a cohort that does not have the right to participate in an organization’s management process. The purpose of this study was to encourage public health officials to make EHIS full partners in their EH departments. Through the use of five surveys, this study was designed to increase awareness and report on the status of EHIS in southwest Ohio health departments. Additionally, this study was intended and to encourage leaders of state and local health departments to communicate when implementing environmental health information systems.

Ohio’s environmental health information systems lack direction and leadership. Without clear leadership, environmental health departments continue to develop information systems that simply plug the latest hole in a leaking system without having a true long-term goal in mind. Current EHIS should be critically evaluated to determine if they meet the needs of Ohio’s environmental health practice. However, before we can examine a system, baseline data must be established by which to measure such systems. EHIS should be constructed and maintained to meet the needs of environmental health in an efficient, accountable, and integrated manner as well as protect and promote the health of the entire population.
Introduction

The terrorist attacks on the United States in 2001 changed not only peoples’ personal lives, but also the way public service agencies conduct their daily business. During the time after the attacks, the world of public health encountered one of the most significant core changes since the pandemic flu of 1918. Infused with an allocation of federal funding and grants in the amount of $1.1 billion in 2002, the public health system was called upon to repair its infrastructure and establish a new discipline of emergency preparedness (Lumpkin, 2002). Public health departments were asked to prepare for emergencies involving chemical, biological, radiological, nuclear, and explosive (CBRNE) weapons. Departments were also asked to begin the process of integrating with other non-health agencies to forge a unified response to emergencies. State health departments were tasked with several deliverables focusing on agency integration. A key deliverable was the adoption and implementation of the National Electronic Disease Surveillance System (NEDSS). The NEDSS was a significant step in the direction of national integration of disease monitoring. The concept of NEDSS is to promote the use of data and information system standards in order to advance the development of efficient, integrated, and interoperable surveillance systems at federal, state, and local levels (CDC, 2007). For a funding-starved public health system the idea of revamping a piecemeal information system, that in some settings did not even exist, had an unfamiliar tone. The NEDSS, a system with its origins in the Centers for Disease Control and Prevention (CDC), introduced a novel combination of technology and collaboration on multiple levels of government. Unfortunately, little leadership was provided on integrating other public health information systems such as environmental health information systems (EHIS). With no central goal in mind at state levels, technology-driven integration of public health services amounted primarily to the purchase of newer and faster computers.
Environmental health science is a core discipline of public health. The Ohio Revised Code (ORC) Chapter 4736.01 defines environmental health science as “the aspect of public health science that includes, but is not limited to, the following bodies of knowledge: air quality, food quality and protection, hazardous and toxic substances, consumer product safety, housing, institutional health and safety, community noise control, radiation protection, recreational facilities, solid and liquid waste management, vector control, drinking water quality, milk sanitation, and rabies control” (ORC, 2007). In the state of Ohio, sanitarians registered with the State Board of Sanitarian Registration primarily practice environmental health through health departments and various state agencies. The practice of environmental health is defined in the ORC as “consultation, instruction, investigation, inspection, or evaluation by an employee of a city health district, a general health district, the environmental protection agency, the department of health, or the department of agriculture requiring specialized knowledge, training, and experience in the field of environmental health science, with the primary purpose of improving or conducting administration or enforcement...” (ORC, 2007).

Early environmental health professionals were embattled with halting large-scale outbreaks of infectious diseases such as cholera. As sanitation and hygienic practices improved and became more accepted, the role of sanitarians changed to one of assurance of established health policies. As a result of these changes, modern public health officials are tasked with managing large amounts of rapidly changing information on a daily basis. Public health information systems have been designed to not only manage data, but to also increase the speed at which meaningful information is distributed. With well-designed information systems, environmental health (EH) departments can build on the advancements that public health has achieved in the last century to continue to improve the health of people in populations.
However, implementation and use of information systems should be a thorough and thoughtful process (Magruder, 2005). Environmental health leaders must weigh numerous options when selecting information systems to enhance health services. Although it may seem elementary, one of the most critical questions that must be answered is "What do I want my information systems to do for me?" It is essential for information systems to produce a meaningful product. Just as a manufacturing company examines the costs and benefits of its various goods, environmental health leaders must assess the long-term goals of their Health Departments and what information systems will best equip them to meet those goals.

The field of computer science and information systems is somewhat of a mystery to many public health professionals. Many believe that information systems are the responsibility of the "computer guy" tucked away in a stuffy network room. In consequence, public and environmental health leaders are often not well equipped to make decisions about the direction of information system development (Yasnoff, 2000). This lack of knowledge has led to the development of the current "patchwork quilt" of incompatible and nonintegrated data systems found in public health agencies at the federal, state, and local levels (Yasnoff, 2000). These single-purpose systems that public health agencies continue to invest in tend to blur the complexities and potential benefit of large-scale integrated information system development. Integrated systems are the very type of systems that public health earnestly needs to analyze data over time and space (Yasnoff, 2000). The continued infusion of federal funding into the public health system provides a unique opportunity to change the very way that environmental health officials practice their science. Federal, state, and local officials must establish clear lines of communication and be accountable for the direction that EHIS follow. Without leadership, environmental health departments will continue to develop information systems that simply plug
the latest hole in a leaking system without having a true long-term goal in mind. The Public Health Data Standards Consortium defines EHIS as "the systematic application of information, computer science, and technology to environmental health practices, research, and learning" (CDC, 2007). An EHIS must be constructed to meet the public health needs of the twenty-first century in an efficient, accountable, and integrated manner that protects and promotes the health of the entire population. To accomplish this, environmental health leaders should:

1. Call upon the expertise of those who are knowledgeable of information systems and environmental health,
2. Call upon leaders in public health to present a clear direction for information system development and integration, and
3. Work to mold an integrated environmental health information system that meets the demands of today and predicts the challenges of tomorrow.
Statement of Purpose

The successful practice of public and environmental health greatly depends upon timely and accurate information. There are five core tasks that are repeated throughout public health: 1) Data collection, 2) Data analysis, 3) Hypothesis development, 4) Management controls establishment, and 5) Evaluation. Each of these five tasks involves data and information systems. For decades, public health officials have heavily relied upon moving information by pen and paper. The data expectations of health officials and of the public continue to grow beyond the capabilities of pen and paper. Consequently, public health departments are implementing computer information systems at an increasing rate. Since computer information systems are somewhat of an undiscovered territory for public health, the selection, quality, and cost-benefit of such systems is not evidence-based.

Public and environmental health officials are aware that quick and precise data collection and analysis can make a significant difference in the morbidity and mortality of a population. Environmental health departments collect massive amounts of data through a complex system of inspections and investigations. EH directors know that the development of computer information systems to manage public health data is a requirement to enhance health services. However, state and local environmental health departments may not have the expertise to make informed decisions about information systems and technology. Efforts to compare and integrate technology into environmental health are splintered. Therefore, the purpose of this study is to:

1) Report on the current state of information systems in southwest Ohio’s environmental health practice,

2) Provide local health departments with baseline data about other public health agencies’ use of environmental health information systems in southwest Ohio,
3) Aid local health departments in making informed decisions about the future of their environmental health information systems, and

4) Encourage leaders of local health departments to communicate when implementing environmental health information systems.

The Ohio Department of Health, the Ohio Department of Agriculture, and the Ohio Environmental Protection Agency could be expected to lead local health districts down a path of integrated environmental health information systems; unfortunately, they have provided little guidance for EH departments. Consequently, this has led local health departments to implement their own information systems. Through the collection of data from local health departments in southwest Ohio, this study examined in-use environmental health information systems and is an effort to encourage open communication between state and local health agencies regarding EHIS. This study, and others that may follow, will foster a common desire for long-term, sustainable, and integrated EHIS that will benefit both environmental health professionals and the citizens they must protect.
Review of Literature

Some of the first information systems created were used to perform accounting calculations in the business world and to link colleges and universities together. These early systems offered little functionality and were often more time-consuming to use than paper and pencil. Today nearly all professional disciplines use information systems to complete daily tasks; in fact, the public expects the world to run on computers and information systems. Technology and information are extensively used in the public health theater. Public health "informatics" is the systematic application of information, computer science, and technology to public health practice, research, and learning (Yasnoff, 2000). Perhaps the most well-documented precursor to public health informatics was generated in 1854 by John Snow. Mr. Snow plotted the geographic distribution of cholera deaths in London and demonstrated the association between these deaths and contaminated water supplies (Vins, 2001). Today environmental health departments use an advanced form of Mr. Snow's geographic distribution maps, called Geographic Information Systems (GIS), to depict spatial relationships between disease and environmental contamination.

Public health is a multifaceted science that has contributed to the improved health of the American population perhaps more substantially than modern medicine. Public health action involves a variety of data analysis and interventions of which many are now taken for granted by the general public (Koo, 2001). While the specific focus and nature of public health interventions continue to evolve, the fundamental principles and processes of public health remain stable: 1) Assess potential public health problems, 2) Intervene to protect the public's health, and 3) Assure that interventions are effective. Every step of this process involves data collection and analysis. Much of the current public health system operates using paper records.
and manual data analysis. The most sweeping changes that have thrust public health into the
technology and information age have occurred in the field of epidemiology – a core science of
public and environmental health (Koo, 2001). Epidemiology has been at the forefront of
information system advancement in public health due to the very nature of the science: tracing
disease movement through time and geographical space in a population. Since public health data
involves multiple health systems and community partners, the timeliness and effectiveness of
interventions that officials implement are highly dependent upon the weakest link of a health
continuum. For example, in 1998 an outbreak of invasive Group A streptococcus occurred in a
small town in central Illinois. In Illinois, Group A streptococcus is a disease that must be
reported to local and state health departments. Three months passed during which ten people
died from Group A infections before the first case was reported to any public health authority
(Lumpkin, 2002). It is possible that, with timely reporting of the illnesses and an integrated
information system, a public health team may have recognized trends, analyzed data, and
implemented control measures to protect citizens’ health.

Although public health agencies use data collected from hospitals and other medical care
organizations, the design of their information systems are strikingly different from other health
agencies. Public health focuses on the health of the population rather than individuals; disease
prevention rather than disease treatment; intervention at all vulnerable points in the causal
pathway of disease or injury; and operation in a governmental rather than a private theater (Koo,
2001). Therefore, public and environmental health information systems collect and handle data
differently from other medical care systems; yet those medical systems often contain the data
that the public health sector needs to make informed decisions. For example, to assess the
overall health and risk status of a community, data must be obtained from multiple sources such
as hospitals, social service agencies, law enforcement, departments of labor and industry, population surveys, and on-site environmental inspections (Koo, 2001). Public health systems must not only integrate with these sources, but also with local, state, and federal information systems to produce a national analysis of health status.

An integrated and technology-driven information system is a critical tool for environmental health professionals. However, this key component of public health infrastructure traditionally has not been strategically planned or funded by any level of government (Koo, 2001). The lack of leadership in designing an integrated EHIS has led to the creation of numerous independent data systems that are commercially available or have been developed in-house at the state and local levels. The federal government has funded public health information systems for disease prevention and control for conditions such as cancer, tuberculosis, and sexually transmitted diseases (Koo, 2001). Such program-specific funding provides no incentives for developing integrated information systems to benefit multiple programs and multiple jurisdictions (Koo, 2001).

In an attempt to avoid falling behind other agencies, environmental health leaders at the local and state levels are often turning to distinct, incompatible, and/or off-the-shelf applications to enter and analyze data. These systems are typically designed to accomplish one or two very specific tasks. Commercial and custom environmental health information systems typically involve high startup costs because of the high demand and low supply of quality systems (Koo, 2001). Data collected by public and environmental health systems is typically difficult to exchange, link, integrate, and utilize to evaluate problems by different people, across time, or from one geographic area to another (Koo, 2001).
Perhaps the most documented use of information systems in the environmental health sector is the Geographical Information System (GIS). GIS refers to computer-based programs used to collect, store, retrieve, and statistically manipulate geographic or location-based information (Croner, 1996). GIS uses two types of data to deliver a usable product to the public health professional: descriptive and spatial. Information such as demographics or health status data is matched with spatial data using geocoding (Croner, 1996). Geocoding refers to the digital procedure used to link map coordinates to data attributes; in essence, two or more distinct pieces of information are properly oriented and then stitched together. For example, if a sanitarian wanted to map the location of houses with contaminated water wells in a community, GIS could convert the street addresses of the houses to points on a map. One of the key features of GIS is the ability to overlay several maps containing seemingly unrelated data. Layers of data in GIS create relationships. One layer may contain the locations of all children (households) under the age of eight and another layer may contain data identifying the years that houses were built. Using these two layers together, environmental health officials can locate children at increased risk of lead poisoning (Choi, 2006). GIS has been used primarily in environmental health programs to map rabies vaccine baiting, locate private water wells and waterways, inventory and map sewage systems, and plan for multi-agency emergency response to man-made and natural disasters.

As indicated earlier, the field of epidemiology has encountered sweeping changes that have thrust public health into the modern information age (Koo, 2001). Although epidemiology is a separate discipline from environmental health, professionals from both sciences work together at health departments on a daily basis. Epidemiologists rely upon the expertise of sanitarians to collect environmental data for analysis and to implement control measures if
necessary. Both epidemiologists and sanitarians use information systems to analyze public health data. The epidemiological information system called “Epi Info” is a suite of public domain computer programs for public health professionals developed by the CDC (Su, 2003). Epi Info, originally created in 1985, is currently available as a free download from the CDC. The current version of Epi Info is Microsoft Windows-based software developed using Microsoft Visual Basic (Su, 2003). Epi Info is used by epidemiologists and environmental health professionals in over 130 countries for rapid questionnaire design, data entry and validation, data analysis including mapping and graphing, and the creation of reports (Su, 2003). With over 1,000,000 downloads in thirteen languages through 2003, it is likely that Epi Info is the most widely distributed and extensively used public domain program for public health in the world (Su, 2003). Epi Info has been downloaded in over 180 countries and is one of the few examples of an integrated public health information system.

There are several national networks that attempt to assess public health information systems and provide data about and integration guidance for information systems. One such network is the CDC Public Health Information Network (PHIN). PHIN is a national initiative created to encourage public and environmental health leaders to use and exchange information electronically (CDC, 2007). PHIN is comprised of local, state, and national public health officials who establish and maintain “PHIN compliance” requirements. The PHIN compliance requirements are designed by CDC partners and all interested parties to:

1. Emphasize the use of electronic information systems to exchange, communicate, and protect data,

2. Describe recommendations that support interoperable information systems implementation,
3. Describe how information systems support typical public health activities, and

4. Provide information to assist in implementing interoperable information systems, including applicable standards, guidelines, examples, best practices, and potential promising practices (CDC, 2007).

Just as the Underwriters Laboratory (UL) establishes compliance guidelines for product safety, the PHIN creates baseline compliance requirements to encourage interoperable information systems. For example, a household extension cord that is UL-approved is a cord that has been developed in accordance with pre-established standards to ensure safety and uniformity. Similarly, an EHIS that meets the PHIN compliance requirements has been designed in a way to permit effective and efficient electronic information sharing between partners (CDC, 2007).

The Info Tech Collaborative is another national organization that is heavily involved in public and environmental health information systems. Info Tech is a partner of the National Turning Point Initiative and is funded by the Robert Wood Johnson Foundation and the W.K. Kellogg Foundation (Info Tech Collaborative, 2007). Turning Point was established in 1997 with the mission to transform and strengthen the public health system in the United States by making it more community-based and collaborative (Turning Point, 2007). In 2000, Turning Point created a partner organization called the Info Tech Collaborative in an effort to strengthen environmental and public health through the use of information systems (Info Tech Collaborative, 2007). The Info Tech Collaborative is comprised of six states including the lead state of Oklahoma, Kansas, New Hampshire, South Carolina, Maine, and Missouri (Info Tech Collaborative, 2007). The mission of Info Tech is to assess, evaluate, and recommend to national public health and policy leaders innovative ways to improve the nation's public health
infrastructure by utilizing information technology (InfoTech Collaborative, 2007). InfoTech’s mission to improve environmental and public health is accomplished by:

1. Effectively collecting, analyzing, and disseminating information on public health information systems,
2. Improving data access and community participation in public health decisions, and
3. Enhancing the performance of the public health system through the use of efficient information technology (InfoTech Collaborative, 2007).

The six state organization has four distinct goals for public health information systems:

1. Identify community information technology to support public health improvement,
2. Develop guidelines and draft technical and data architecture for public health,
3. Develop an inventory of current information technology practices that support the core functions of assessment, policy development, and assurance, and
4. Identify funding strategies to support public health information technology (InfoTech Collaborative, 2007).

Ultimately, the InfoTech Collaborative works to inform environmental and public health departments about current information technology that is being used and is available. InfoTech develops a framework for public health information systems to be used at the local and state levels and helps locate money for public health agencies to implement information systems. For example, InfoTech maintains a database called the Public Health Information Systems Catalog. This catalog of software applications is freely available for viewing and modifying and includes information about public and environmental health software, the technical architecture required to use the applications, the specific capabilities of various systems, and the community resources necessary to support the systems (InfoTech Collaborative, 2007). This database was created
from a survey, developed by InfoTech, of the information systems in use at more than 3,000 state and local public health agencies throughout the United States.
Methods

The purpose of this study was to report on the state of environmental health information systems (EHIS) in local health departments in southwest Ohio. The sample group was comprised of twenty-eight local health departments located in southwest Ohio. For the purposes of this study, the southwest region of Ohio was defined by the Ohio Department of Health’s Local Health District Directory (Appendix A). A packet of original surveys (Appendices C to G) was mailed to all twenty-eight health departments on July 16, 2007. Each packet contained the following information:

1. A cover letter personally hand-addressed to the Health Commissioner or Administrator explaining the purpose and scope of the survey.
2. An instruction sheet for the Health Commissioner or Administrator explaining who to distribute the surveys to, the deadline for submission, and general contact information.
3. One survey to be completed by the Health Commissioner (HC) or Administrator.
4. One survey to be completed by the Environmental Health Director (EHD).
5. One survey to be completed by the Information Technology Administrator (ITA).
6. One survey to be completed by a Field Sanitarian working in the Sewage and/or Water Program (FSSW).
7. One survey to be completed by a Field Sanitarian working in the Food Program (FSF).
8. A self-addressed and pre-stamped envelope to return completed surveys.

In the case that a health department did not have all five positions (HC, EHD, ITA, FSSW, and FSF) filled, the health commissioner or environmental health director was advised to complete the surveys as thoroughly as possible.
Page one of each survey was a list of instructions and explanations. The instruction page explained the purpose and scope of the study and presented a definition of an environmental health information system. At the end of the instruction page was a reminder that asked respondents not to include any personally identifiable information on the survey. While each survey contained many of the same questions, each survey was designed for a specific group and contained several questions tailored specifically to the target group. For example, the health commissioner survey contained a question regarding the entire health department’s budget, while all other surveys did not contain this question. Although the surveys slightly differed, each survey had three primary target assessments:

a. Education, experience, and expertise

b. General guidance on EHIS

c. EHIS used at the health department

Three separate survey reminders were electronically mailed to all twenty-eight health departments on August 1, 9, and 15, 2007. The deadline for survey completion and remittance was August 15, 2007. Surveys utilized in the study had to be postmarked on or before August 15. All surveys received in the mail after August 18 were not included in the study. The surveys captured both quantitative and qualitative data. Qualitative response questions were short answer questions. A Likert-like scale was used to capture responses to several questions; the scale ranged from zero to ten. Both qualitative and quantitative data were analyzed using Microsoft Office Excel 2003 SP2.

As surveys were returned and analyzed, it was quickly apparent that several methodology masks and rules needed to be established:
1. Employees were defined as full-time or part-time and did not include contract employees.

2. Many city health departments did not have a sewage and/or water program. These surveys were either not returned or were left completely blank. Surveys such as these were not included in the study.

3. Survey answers that were not physically legible or were not clearly understood were not included in the study. Qualitative answers to “yes” and “no” questions often involved an explanation. Answers to these types of questions had to be at least 51% weighted to one answer or the other to be included in the survey; all other answers were not included in the survey.

4. Qualitative answers to survey questions had to be repeated at least the number of times the question appeared on different surveys to be included in the data analysis. For example: all five surveys asked the respondents to indicate what an EHIS should do for their EH department. For an answer to this question to be included in the data analysis, a response had to be repeated at least five times.

5. Several qualitative short answer questions resulted in responses that were similar and only varied in word choice. Such answers were carefully and specifically grouped into one common/neutral answer category that did not blur the true intent of each response to allow for meaningful data analysis.
Results and Data Analysis

Twenty-one of the twenty-eight health departments (75% response rate) returned at least one of the five surveys on or before the August 15 deadline. A total of ninety-three surveys were completed and returned. The responding health departments served a mean population of 82,953 and a median of 44,250. The mean population served by all health departments in the southwest region of Ohio is 103,648 and a median of 44,240. Therefore, when comparing population served, the responding departments were representative of all health departments in the southwest region.

The majority of the meaningful data derived from the surveys focused on EHIS satisfaction, importance, training, capabilities, complaints, and needs. Individual EHIS used in four programs (food, nuisance, sewage, and operational permit) will be explored in detail later in the analysis. It is important to note that all health departments responding to the survey were using an EHIS in at least one of the four programs. Each survey group was asked to rate their overall satisfaction level with their current EHIS and the importance of EHIS. All groups except for the health commissioners were also asked to rate their overall training satisfaction of their EHIS. Unless otherwise specified, all measures of satisfaction and importance were obtained using a Likert-like scale from zero to ten; a rating of ten represented the highest satisfaction or importance and zero represented the lowest satisfaction or importance. The mean results for EHIS satisfaction and importance are listed by group in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>HC</th>
<th>EHD</th>
<th>ITA</th>
<th>FSSW</th>
<th>FSF</th>
<th>Mean</th>
</tr>
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<tbody>
<tr>
<td>Overall EHIS Satisfaction</td>
<td>6.40</td>
<td>7.00</td>
<td>6.50</td>
<td>6.77</td>
<td>6.19</td>
<td>6.57</td>
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<tr>
<td>Overall EHIS Importance</td>
<td>8.25</td>
<td>8.14</td>
<td>8.50</td>
<td>7.00</td>
<td>7.35</td>
<td>7.85</td>
</tr>
<tr>
<td>Overall EHIS Training Satisfaction</td>
<td>5.62</td>
<td>5.64</td>
<td>5.69</td>
<td>4.88</td>
<td>5.46</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Mean EHIS Satisfaction, Importance, and Training
Overall EHIS satisfaction was 6.57 and EHIS importance was 7.85. Environmental health directors were the most satisfied with their EHIS and field sanitarians working in the food program were the least satisfied. Information technology administrators rated EHIS importance higher than any other of the five groups while field sanitarians working in the sewage and/or water program rated EHIS importance the lowest. Overall satisfaction with EHIS training was 5.46. Field sanitarians working in the food program were the least satisfied with training while field sanitarians working in the sewage and/or water programs were the most satisfied.

All survey groups were asked to respond to a series of questions regarding EHIS leadership and integration. An example of EHIS integration was provided on the survey to ensure a consistent meaning of “integration.” The groups were asked to respond to three “yes or no” questions: 1) Should state agencies take the lead for local health departments when deciding what EHIS to use, 2) Have state agencies taken the lead for local health departments when deciding what EHIS to use, 3) Should EHIS integrate across jurisdictional boundaries? The results of these questions are contained in Table 2 and are represented as percent “yes” responses.

<table>
<thead>
<tr>
<th></th>
<th>HC</th>
<th>EHD</th>
<th>ITA</th>
<th>FSSW</th>
<th>FSF</th>
<th>Mean</th>
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</thead>
<tbody>
<tr>
<td>State Should Lead (% Yes)</td>
<td>78.95</td>
<td>52.63</td>
<td>71.43</td>
<td>64.29</td>
<td>86.67</td>
<td>70.79</td>
</tr>
<tr>
<td>State Has Led (% Yes)</td>
<td>0.00</td>
<td>15.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Integration (% Yes)</td>
<td>68.42</td>
<td>63.16</td>
<td>91.67</td>
<td>76.92</td>
<td>92.86</td>
<td>78.61</td>
</tr>
</tbody>
</table>

Table 2: EHIS Leadership and Integration

Over all five groups, 70.79% of respondents believed that state agencies should lead when selecting EHIS to use for mandated EH programs. Just over half (52.63%) of EHD responding believed that the state should lead while 86.67% of FSF suggested that the state should lead in EHIS selection. Only 3.00% of survey respondents felt that state agencies have provided
leadership for EHIS. Overall, 78.61% of respondents believed that EHIS should be able to integrate across jurisdictional boundaries. Integration was favored by 92.86% of FSF and 63.16% of EHD.

All five survey groups were asked to write the top three things that EHIS should be capable of doing for their environmental health department. The three most repeated answers on the survey were:

1. Data management and electronic filing {39 responses}
2. Report and statistic generation {26 responses}
3. Electronic (field) inspections and posting of data {21 responses}

Groups were also asked to list their primary concern regarding EHIS and their health department. The three most repeated answers on the survey were:

1. Cost of EHIS {14 responses}
2. User friendly interface {13 responses}
3. Electronic (field) inspections and posting of data {8 responses}

All groups were surveyed about their specific EHIS currently used in four environmental programs: food safety/inspections, nuisance abatement, new sewage design/installation, and operational permit inspections.

**Food Safety/Inspections EHIS**

Twenty of the twenty-one (95.24%) responding health departments used an EHIS for the food program. Twelve of the twenty (60%) used a program called Health District Information Software (HDIS), seven (35%) used the state-created Food Service Operation Licensing Program
(FSOLP), and one used a county-mandated program called CAGIS. Table 3 contains reported satisfaction levels for food EHIS programs and training.

<table>
<thead>
<tr>
<th></th>
<th>EHD</th>
<th>ITA</th>
<th>FSSW</th>
<th>FSF</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall Food EHIS Satisfaction</strong></td>
<td>7.31</td>
<td>7.33</td>
<td>6.29</td>
<td>6.40</td>
<td>6.83</td>
</tr>
<tr>
<td><strong>Food HDIS Satisfaction</strong></td>
<td>7.36</td>
<td>8.29</td>
<td>6.50</td>
<td>7.30</td>
<td>7.36</td>
</tr>
<tr>
<td><strong>Food FSOLP Satisfaction</strong></td>
<td>7.20</td>
<td>5.50</td>
<td>No responses</td>
<td>4.25</td>
<td>5.65</td>
</tr>
<tr>
<td><strong>Food EHIS Training Satisfaction</strong></td>
<td>5.53</td>
<td>5.83</td>
<td>5.31</td>
<td>5.56</td>
<td>5.56</td>
</tr>
</tbody>
</table>

Table 3: Food EHIS Satisfaction

Overall satisfaction of food EHIS was 6.83. Satisfaction with HDIS was 7.36 while satisfaction with FSOLP was 5.65. Training satisfaction for all food EHIS was 5.56.

Environmental health directors and information technology administrators were asked to identify the reason they selected their EHIS for the food program. Combined responses are as follows:

1. Cost of EHIS {10 responses}
2. Already in place before taking the job {4 responses}
3. Other health departments using this EHIS and/or was recommended {4 responses}

All survey groups were asked to explain their primary complaint about their food EHIS:

1. Not user friendly {10 responses}
2. Inadequate customer service/support {6 responses}
3. Not meeting the needs and capabilities are limited {6 responses}
4. System is unreliable and has glitches {5 responses}

All survey groups were also asked to indicate what they want a food EHIS to do:

1. Be more user friendly {8 responses}
2. Generate reports and statistics {8 responses}
3. Allow for customization {6 responses}
4. Be capable of electronic (field) inspections and posting of data {5 responses}
5. Allow for scheduling of inspections {4 responses}
6. Come with better training {4 responses}

**Nuisance Abatement EHIS**

Fifteen of the twenty-one (71.43%) responding health departments used an EHIS for the nuisance abatement program. Ten of the fifteen (66.7%) used HDIS and five (33.3%) used either a county-mandated program or a custom program developed at their individual health department (referred to as “in-house” programs). Table 4 contains reported satisfaction levels for nuisance abatement EHIS programs and training.

<table>
<thead>
<tr>
<th></th>
<th>EHD</th>
<th>ITA</th>
<th>FSSW</th>
<th>FSF</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Nuisance EHIS Satisfaction</td>
<td>6.54</td>
<td>7.00</td>
<td>6.87</td>
<td>7.36</td>
<td>6.94</td>
</tr>
<tr>
<td>Nuisance HDIS Satisfaction</td>
<td>6.30</td>
<td>7.75</td>
<td>6.40</td>
<td>7.83</td>
<td>7.07</td>
</tr>
<tr>
<td>Nuisance Mandatory/In-house Satisfaction</td>
<td>7.30</td>
<td>6.25</td>
<td>8.00</td>
<td>6.80</td>
<td>7.09</td>
</tr>
<tr>
<td>Nuisance EHIS Training Satisfaction</td>
<td>5.38</td>
<td>5.86</td>
<td>6.11</td>
<td>5.78</td>
<td></td>
</tr>
</tbody>
</table>

*Table 4: Nuisance EHIS Satisfaction*

Overall satisfaction of nuisance EHIS was 6.94. Satisfaction with HDIS was 7.07 while satisfaction with mandatory and in-house programs was 7.09. Training satisfaction for all nuisance EHIS was 5.78.

Environmental health directors and information technology administrators were asked to identify the reason they selected their EHIS for the nuisance program. Combined responses are as follows:
1. Already in place before taking the job {5 responses}
2. Mandatory for the county/city {3 responses}
3. Cost of EHIS {3 responses}
4. Recommendation of ITA {2 responses}

All survey groups were asked to explain their primary complaint about their nuisance EHIS:

1. Not user friendly {9 responses}
2. Reports, statistics, and search options inadequate {6 responses}

All survey groups were also asked to indicate what they want a nuisance EHIS to do:

1. Be more user friendly {6 responses}
2. Allow for customization {6 responses}
3. Come with better training {4 responses}

New Sewage Design/Installation

Fifteen of the twenty (75%) responding health departments used an EHIS for the sewage program. Ten of the fifteen (66.7%) used HDIS and five (33.3%) used county-mandated programs, in-house programs, and/or GIS. Table 5 contains reported satisfaction levels for sewage EHIS programs and training.

<table>
<thead>
<tr>
<th>EHD</th>
<th>ITA</th>
<th>FSSW</th>
<th>FSF</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Sewage EHIS Satisfaction</td>
<td>7.00</td>
<td>7.67</td>
<td>6.33</td>
<td>6.76</td>
</tr>
<tr>
<td>Sewage HDIS Satisfaction</td>
<td>6.50</td>
<td>7.33</td>
<td>5.60</td>
<td>7.67</td>
</tr>
<tr>
<td>Sewage Mandatory/In-house/GIS Satisfaction</td>
<td>7.30</td>
<td>8.00</td>
<td>7.25</td>
<td>No responses</td>
</tr>
<tr>
<td>Sewage EHIS Training Satisfaction</td>
<td>5.08</td>
<td>5.88</td>
<td>6.50</td>
<td>5.82</td>
</tr>
</tbody>
</table>

Table 5: Sewage EHIS Satisfaction
Overall satisfaction of sewage EHIS was 6.94. Satisfaction with HDIS was 6.78 while satisfaction with mandatory, in-house, and/or GIS programs was 7.52. Training satisfaction for all sewage EHIS was 5.82.

Environmental health directors and information technology administrators were asked to identify the reason they selected their EHIS for the sewage program. Combined responses are as follows:

1. Cost of EHIS {4 responses}
2. Other health departments using this EHIS and/or was recommended {4 responses}
3. Already in place before taking the job {4 responses}
4. Mandatory for the county/city {2 responses}

All survey groups were asked to explain their primary complaint about their sewage EHIS:

1. Not user friendly {7 responses}
2. No or poor integration with other programs {4 responses}
3. Reports, statistics, and search options inadequate {4 responses}

All survey groups were also asked to indicate what they want a sewage EHIS to do:

1. Allow for customization {4 responses}
2. Come with better training {4 responses}
3. Have good data management and electronic filing capabilities {4 responses}

**Operational Permit Inspections**

Fifteen of the twenty (75%) responding health departments used an EHIS for the operational permit program (OPP). Ten of the fifteen (66.7%) used HDIS and five (33.3%) used
county-mandated programs, in-house programs, and/or GIS. Table 6 contains reported satisfaction levels for operational permit EHIS programs and training.

<table>
<thead>
<tr>
<th></th>
<th>EHD</th>
<th>ITA</th>
<th>FSSW</th>
<th>FSF</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall OPP EHIS Satisf</td>
<td>6.40</td>
<td>7.00</td>
<td>6.44</td>
<td>5.67</td>
<td>6.38</td>
</tr>
<tr>
<td>OPP HDIS Satisfaction</td>
<td>6.00</td>
<td>6.50</td>
<td>6.80</td>
<td>5.67</td>
<td>6.24</td>
</tr>
<tr>
<td>OPP Mandatory/In-house/GIS Satisfaction</td>
<td>7.00</td>
<td>7.50</td>
<td>6.00</td>
<td>No responses</td>
<td>6.83</td>
</tr>
<tr>
<td>OPP EHIS Training Satisfaction</td>
<td>5.00</td>
<td>4.88</td>
<td>6.50</td>
<td>5.46</td>
<td></td>
</tr>
</tbody>
</table>

Table 6: OPP EHIS Satisfaction

Overall satisfaction of OPP EHIS was 6.38. Satisfaction with HDIS was 6.24 while satisfaction with mandatory, in-house, and GIS programs was 6.83. Training satisfaction for all sewage EHIS was 5.46.

Environmental health directors and information technology administrators were asked to identify the reason they selected their EHIS for the operational permit program. Combined responses are as follows:

1. Already in place before taking the job {4 responses}
2. Other health departments using this EHIS and/or was recommended {3 responses}
3. Versatility {3 responses}
4. Cost of EHIS {3 responses}
5. Mandatory for the county/city {2 responses}

All survey groups were asked to explain their primary complaint about their OPP EHIS:

1. System is unreliable and has glitches {5 responses}
2. Not user friendly {4 responses}

All survey groups were also asked to indicate what they want an OPP EHIS to do:
1. Come with better training {5 responses}
2. Generate reports and statistics {5 responses}
3. Allow for customization {4 responses}

Survey respondents’ primary complaint and desired capabilities for EHIS were compiled in Table 7. Nearly half (45.45%) of all respondents indicated that the primary complaint about their EHIS is that it is not user friendly. More than one-fourth (25.97%) of respondents wanted their EHIS capable of being customized.

<table>
<thead>
<tr>
<th>EHIS Complaints</th>
<th>Number of times answer was repeated</th>
<th>Percent of total responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not user friendly</td>
<td>30</td>
<td>45.45</td>
</tr>
<tr>
<td>Reports, statistics, search inadequate</td>
<td>10</td>
<td>15.15</td>
</tr>
<tr>
<td>System unreliable, glitches</td>
<td>10</td>
<td>15.15</td>
</tr>
<tr>
<td>Customer support/service inadequate</td>
<td>6</td>
<td>9.09</td>
</tr>
<tr>
<td>Not meeting needs, limited</td>
<td>6</td>
<td>9.09</td>
</tr>
<tr>
<td>No integration</td>
<td>4</td>
<td>6.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EHIS Desired Capabilities</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow customization</td>
<td>20</td>
<td>25.97</td>
</tr>
<tr>
<td>Provide better training</td>
<td>17</td>
<td>22.08</td>
</tr>
<tr>
<td>Be more user friendly</td>
<td>14</td>
<td>18.18</td>
</tr>
<tr>
<td>Improve reports, statistics, search</td>
<td>13</td>
<td>16.88</td>
</tr>
<tr>
<td>Electronic (field) inspections and posting</td>
<td>5</td>
<td>6.49</td>
</tr>
<tr>
<td>Scheduling</td>
<td>4</td>
<td>5.19</td>
</tr>
<tr>
<td>Data management</td>
<td>4</td>
<td>5.19</td>
</tr>
</tbody>
</table>

Table 7: Compiled EHIS Complaints and Desired Capabilities

The remaining data collected from the surveys was used to determine if there were correlations between EHIS satisfaction and importance with numerous other factors. Technical computer training among health commissioners and environmental health directors was 30% (six
out of twenty) and 19.05% (four out of twenty-one) respectively. Technical training backgrounds of HC and EHD did not appear to significantly influence their EHIS satisfaction and importance at the $\alpha=0.05$ level. A one-way analysis of variance (ANOVA) was performed on these sets of data and the results are listed in Table 8.

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>F_{critical}</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC Technical Training and HC EHIS Satisfaction</td>
<td>0.09</td>
<td>4.41</td>
<td>0.77</td>
</tr>
<tr>
<td>HC Technical Training and HC EHIS Importance</td>
<td>3.03</td>
<td>4.41</td>
<td>0.10</td>
</tr>
<tr>
<td>EHD Technical Training and EHD EHIS Satisfaction</td>
<td>0.39</td>
<td>4.45</td>
<td>0.54</td>
</tr>
<tr>
<td>EHD Technical Training and EHD EHIS Importance</td>
<td>1.25</td>
<td>4.38</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Table 8: HC and EHD Technical Training and EHIS Satisfaction, Importance

The number of years of public health employment for an EHD did not appear to significantly affect the EHIS satisfaction or importance rating. However, as the number of years of public health employment for a HC increases, so did the overall EHIS satisfaction (Figure 1). A regression analysis was performed on these sets of data and the results are listed in Table 9.

<table>
<thead>
<tr>
<th></th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC Years in Public Health and HC EHIS Satisfaction</td>
<td>0.046</td>
</tr>
<tr>
<td>HC Years in Public Health and HC EHIS Importance</td>
<td>0.88</td>
</tr>
<tr>
<td>EHD Years in Public Health and EHD EHIS Satisfaction</td>
<td>0.49</td>
</tr>
<tr>
<td>EHD Years in Public Health and EHD EHIS Importance</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Table 9: HC and EHD Years in Public Health and EHIS Satisfaction, Importance
The mean percentage of a health department's budget spent on information technology (IT) was 1.58% with a median actual value of $18,000. The median percentage of a health department's public health infrastructure grant (PHIG) spent on IT was 10.00% (mean 15.89%). The percentage of a health department's budget spent on IT did not appear to significantly influence the overall EHIS satisfaction at the $\alpha=0.05$ level. Similarly, the presence or absence of a technical/computer training background of health commissioners did not significantly affect the amount of the regular budget or PHIG that was spent on IT. A one-way ANOVA and a regression analysis were performed on these sets of data accordingly and the results are listed in Table 10.
<table>
<thead>
<tr>
<th>Percent Budget Spent on IT and Overall EHIS Satisfaction</th>
<th>F</th>
<th>F_{critical}</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>0.39</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent PHIG Spent on IT and Overall EHIS Satisfaction</th>
<th>F</th>
<th>F_{critical}</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>0.55</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HC Technical Training and Percent Budget Spent on IT</th>
<th>F</th>
<th>F_{critical}</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.21</td>
<td>4.54</td>
<td>0.65</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HC Technical Training and Percent PHIG Spent on IT</th>
<th>F</th>
<th>F_{critical}</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>4.67</td>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

*Table 10: Percent Budget and PHIG Spent on IT and HC Technical/Computer Training, Overall EHIS Satisfaction*

Twelve of the twenty (60.0%) health departments responding employed either a full-time or part-time information technology administrator (ITA). Four of twenty (20%) health commissioners who responded to the survey reported having a full-time ITA on staff. Seven of twenty (35%) reported having some IT staff hours provided to the environmental health department but not through an employee of the health department; although it is only a conjecture, it can be reasonably assumed that most of these departments received IT support from a city or county government IT department. One health department reports that it received no IT support (zero hours per week) for the environmental health division. The median hours per week that an ITA spent providing support to environmental health was 2.0 hours according to the EHD; however, according to the ITA survey responses, the median number of hours spent in EH was 2.5. A regression analysis indicated that the number of hours that ITA spent in EH each week did not appear to significantly affect the overall EHIS satisfaction level (p=0.48).
Discussion

Although the sample size of this study was relatively small, a 75% response rate helped to validate its significance. The primary purpose and deliverable of this study was to report on the current state of EHIS in southwest Ohio; for this reason, tests of significance for data comparisons are secondary to reporting on qualitative data collected from survey respondents. The group of individuals responding to the survey have been in the business of public health for numerous years. The mean number of years that responding health commissioners and environmental health directors have been in public health was approximately nineteen years each. However, information technology administrators averaged just over nine years of public health experience. Overall, the respondents carried a formidable amount of public health experience.

Three key components of this survey were to measure the satisfaction of environmental health professionals with their current EHIS, the importance of their EHIS, and how they would rate the training they have received on their EHIS. An overview of the satisfaction and importance rankings is listed in Table 11.

<table>
<thead>
<tr>
<th></th>
<th>Likert-like scale mean rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall EHIS Satisfaction</td>
<td>6.57</td>
</tr>
<tr>
<td>Overall EHIS Importance</td>
<td>7.85</td>
</tr>
<tr>
<td>Overall EHIS Training Satisfaction</td>
<td>5.46</td>
</tr>
</tbody>
</table>

Table 11: EHIS Satisfaction, Importance, Training Overview

Overall, the health commissioners, information technology administrators, and environmental health professionals surveyed lean more toward “somewhat satisfied” than “very satisfied” with their EHIS at a mean rating of 6.57. EHIS importance ranks near “very important” at a mean of 7.85. EHIS training satisfaction is near the middle of the scale at 5.46 equating to “somewhat
satisfied.” Therefore, respondents regard EHIS as being very important, but are only somewhat satisfied with the current EHIS and the training they received for the systems.

Several factors that may affect EHIS satisfaction and importance were statistically evaluated using ANOVA and regression calculations as appropriate. These statistical techniques revealed:

1. The percentage of a health department’s regular budget and/or PHIG that is spent on IT did not significantly affect EHIS satisfaction.

2. The presence of a technical/computer training background for a health commissioner or environmental health director did not significantly affect their EHIS satisfaction or importance.

3. Having a full-time and/or part-time IT staff member did not significantly affect EHIS satisfaction.

4. The number of hours that an IT staff member spent in EH per week did not significantly affect EHIS satisfaction.

5. The number of years that a health commissioner or environmental health director has spent in the public health profession did not significantly affect EHIS importance.

6. The number of years that an environmental health director has spent in the public health profession did not significantly affect EHIS satisfaction.

7. The number of years that a health commissioner has spent in the public health profession had an effect on the EHIS satisfaction. The regression analysis of this data revealed a p-value=0.046 (slightly significant).

Overall there were no significant differences between the satisfaction levels of the program-specific EHIS. However, respondents were nearly one point more satisfied with in-house,
mandated, and/or GIS programs in the sewage program over HDIS respondents. This difference may be due to the fact that in-house systems can be customized to meet the specific needs of a complex program such as the sewage program. Furthermore, EH professionals often regard GIS as the “Cadillac” of sewage EHIS programs and, therefore, this may result in a higher satisfaction rating.

The qualitative data derived from the survey respondents provided some useful points of discussion. The primary complaint about current EHIS was that they were not user friendly. It is likely that this complaint alone significantly affected EHIS satisfaction. The fact that the primary complaint about EHIS was the poor user friendliness of the systems may have been directly related to the training satisfaction level of EH professionals. EHIS users may have felt that the system was not user friendly because of inadequate training. In another qualitative short-answer question, respondents were asked to identify what they believe EHIS should do for them. The most repeated answer (thirty-nine responses) was data management and electronic filing. The term “data management” was very vague. This foggy vision of what EHIS should accomplish highlighted a disconnect between EH professionals and IT professionals.

Another survey question asked respondents to explain their primary concern for their EHIS. The most repeated answer was “costs” (fourteen responses). “User friendly systems” was the second most repeated answer (thirteen responses). For each EH program (food, nuisance, sewage, operational permit), survey respondents were asked to identify what they wanted their EHIS to do for them. Four answers accounted for over 60% of the total responses:

1. Retain the ability to customize the EHIS.
2. Receive better training on the EHIS.
3. Create a more user-friendly interface.
4. Generate better statistics and reports.  

According to these responses, a satisfying EHIS would be customizable, come with excellent training, have a user-friendly interface, generate custom statistics and reports, and be inexpensive.  

There is a reason why studies such as this will continue to be conducted in Ohio – there is no EHIS leadership in Ohio’s public health profession. Nearly 71% of all survey respondents believe that state agencies should take the lead when deciding upon EHIS to use for mandated environmental health programs. Only 3% of those surveyed believe that Ohio’s state agencies have taken the lead on EHIS for local health departments. Furthermore, the lowest program-specific EHIS satisfaction rating was for the FSOLP – a state (ODH) created EHIS. Again, this highlighted a disconnect between state and local health departments. Local health departments want state agencies to lead, but they are not doing so. Over 78% of survey respondents believed that EHIS should integrate across jurisdictional boundaries. However, since there is no EHIS leadership, it is difficult to envision how integration will be possible.  

Information technology administrators cannot predict the needs of EH departments. EHIS development is not the sole responsibility of any one person. The selection of EHIS is a complex process that must involve all levels of a health department. Although health commissioners typically handle the budget of the department, input on the needs of an efficient EHIS must be sought from the IT administrator, the EH director, and field sanitarians. Several of the highest and lowest satisfaction ratings in this survey on program-specific EHIS were from field sanitarians. This means that field sanitarians are perhaps the most critical of the EHIS that they use on a daily basis and, therefore, may offer some of the most valuable input on EHIS needs.
Public health is a broad discipline that encompasses clinical services, disease surveillance, vital statistics, environmental health assessments, and public education. The field of public health is often difficult to fully comprehend for those outside departments of health. For this reason, IT professionals struggle when attempting to address all of the perceived needs of public health agencies. Not only do they lack depth in knowledge of current public health services, but information system experts also have difficulty predicting the needs of public health in the future. Consequently, this has led to the development of a rift between what public health professionals desire and what information system professionals can provide.

To design efficient and integrated EHIS, public health agencies should define what they want to do with data, where they want that data to go, and how they will integrate the data with other agencies within and outside of their jurisdictional boundaries. First, leadership in EHIS should be established. Second, environmental health should clearly define its data needs, the sources of the data, and then arrive at a consensus on data and communication standards (Koo, 2001). Third, environmental health leaders should write standards to support data sharing and tools for accessing and disseminating data in a useful manner to improve data quality (Koo, 2001). Fourth, environmental health leaders should facilitate the improved exchange of information between public health and the world of medical care (Koo, 2001). Fifth, data should be populated into an integrated public health information system to allow health officials to make rapid and accurate assessments and disease control responses (Koo, 2001).

Information sharing via electronic systems and data exchange provides the means by which public health, environmental health, and medical care agencies can integrate their activities. However, there are four additional issues that must be addressed for the future of environmental health information systems. First, funding should be provided for any
information system integration activity (Magruder, 2005). The public health system has been under-funded for years. Although the latest infusion of federal money into the public health system was targeted to stabilize the infrastructure of the system, guidance was not offered by federal or state officials as to the shape that a public health information system should take.

Second, definitive national leadership should be established to lead the United States public health system into an integrated data management continuum. The system should have core leadership comprised of public health, clinical care, and computer science professionals to set a course for the future of information systems in public and environmental health. Third, the public and environmental health professions face an uphill battle of information integration. There are over 3,000 local public health agencies in the United States (Koo, 2001). This equates to hundreds or thousands of unconnected information systems in use. The vision of creating a national public and environmental health information system should carefully address individual health data systems. Fourth, the “open source” community should be thoroughly explored. Only two of thirteen (15.38%) ITA respondents indicated that they used any type of open source software. Open source software communities are defined as individuals, groups, and companies who use and distribute free software because they believe that the freedom to collaborate with others should be a fundamental human right (Open Source Initiative, 2007). The goals of open source are better quality, higher reliability, more flexibility, and lower cost (Open Source Initiative, 2007). All of these open source goals were found in the responses on the surveys collected during this study.
Limitations and Future Studies

The most well-planned study has limits. The study of EHIS in southwest Ohio is no exception to this statement. The sample size of this survey was twenty-eight. Of the sample, twenty-one health departments responded to the survey. Although the response rate (75%) was excellent, the relatively small sample size decreases the statistical significance of the study. The small sample size also depressed the statistical significance of several data comparisons in the study. Of the eight ANOVA calculated on data comparisons, none were statistically significant; however, two comparisons were nearly significant. Of the seven regression analyses calculated on data comparisons, only one was slightly significant. With a larger sample size, and a more complete response from all survey groups, many of these data comparisons and relationships may have been significant.

All five survey groups (HC, EHD, ITA, FSSW, and FSF) were presented with several questions about their satisfaction with certain EHIS. “Satisfaction” was not defined prior to the survey and may take on different meanings to different survey respondents. To a health commissioner, satisfaction may be defined as cost effective. To a field sanitarian, satisfaction may be defined as the speed and ease in identifying repeat offenders. Similarly, a respondent may be fully satisfied with their current EHIS simply because they have never had any experience with a different, perhaps more satisfying, EHIS.

The survey instructions indicated that all surveys should be returned to the health commissioner or administrator for bulk return mailing. Knowing that the health commissioner could examine the surveys before mailing them may have influenced some respondents to answer questions in a specific manner. Although there is no reason to suspect that the surveys were not truthful, in the case of a future study the anonymity and confidentiality of a survey may
produce more reliable results. All five survey groups were asked if EHIS should integrate across jurisdictional boundaries. After the question an example/explanation was provided: “For example, is it important for county A to be able to seamlessly compare data to county B.” The nature of this example/explanation may have led the respondents to answer a specific way.

Post-survey data compilation is complex and challenging to do without violating the meaning of the respondents’ intended answers. Several questions, such as “What do you wish this EHIS could do for you...,” required a written short answer response. These types of qualitative responses are difficult to analyze. To establish any trend in this data the answers must be carefully and specifically examined for similarities. When such similarities were discovered, the short answer responses were grouped into a common/neutral answer category that did not blur the true intent of each response. However, this is a position in the study where error could have been introduced. Due to the variability in the qualitative answers, future studies should be designed with more quantitative assessments. Alternatively, qualitative questions should be designed to elicit more specific answers to reduce the amount of post-survey grouping.

EHIS assessments rely heavily on qualitative data to produce meaningful results. A focus group should be considered for future studies. Focus groups are used to produce words as opposed to numbers. EHIS focus groups should be separately conducted for each subgroup (HC, EHD, ITA, FSSW, and FSF) to improve response in an environment of peers. The groups should work to define specific EHIS needs. Focus groups can be conducted by teleconference, web conference, or face-to-face. In addition to a focus group, an electronic survey, as opposed to a paper survey, may provide real-time data and result in a higher response rate. Although the majority of the data collected is qualitative, any future studies collecting quantitative data should
use a true Likert scale; a traditional zero-to-five scale with varying levels of “agreement” may produce results that would be easier to compare to existing data.

Nearly 79% of survey respondents believed that state agencies should be responsible for establishing leadership for EHIS selection and implementation. Unfortunately, only 3% of survey respondents believed that state agencies have led in the field of EHIS. All future studies on Ohio’s EHIS should actively involve state agencies. Such agencies should be directly involved in surveys and/or focus groups to solicit their input and to help forge meaningful relationships with local environmental health departments.
References


Ohio Revised Code 4736.01 State Board of Sanitarian Registration Definitions, 4736.01 (2004).


Appendix A: Ohio Department of Health Local Health District Directory Map – SW

Local Health Districts in Southwest Ohio:

Adams County Board of Health
Brown County Health Department
Butler County Combined General Health District
Champaign Health District
Cincinnati City Health Department
Clark County Combined Health District
Clermont County General Health District
Clinton County Board of Health
Darke County General Health District
Fayette County Combined Health District
Greene County Combined Health District
Hamilton City Health Department
Hamilton County General Health District
Logan County General Health District

Madison County-London City Health District
Miami County Health District
Highland County Health Department
Middletown City Health Department
Norwood City Health Department
Oakwood City Health Department
Public Health of Dayton-Montgomery County
Preble County General Health District
Sharonville City Health Department
Sidney-Shelby County Health District
Springdale City Health Department
St. Bernard City Health Department
Warren County Combined Health District
Appendix B: Survey Cover Letter

July 16, 2007

My name is Chris Cook and I am a Registered Sanitarian with the Miami County Health District. I am also a Master of Public Health (MPH) candidate at Wright State University (WSU). The MPH program at WSU concludes with a "Culminating Experience" (CE). The CE is an applied research project that entails research, a presentation, and a manuscript. It is truly the application of what I have learned over the past two years in the MPH program to a worthwhile project of my choice to impact public health in Ohio.

Now to the point of this letter: I need your help to finish my MPH.

My CE project is entitled "Environmental Health Information Systems: More Than Just Gigabytes." By the end of my CE project I hope to:

5) Find and report on the state of information systems in southwest Ohio’s environmental health practice,
6) Provide local health departments with baseline data about other public health agencies’ use of information systems in southwest Ohio,
7) Aid local health departments in making informed decisions about the future of their information systems, and
8) Encourage leaders of the state and local health departments to communicate when implementing environmental health information systems.

This is where I need your help. To accomplish my goals, I am surveying all twenty-eight public health departments in southwest Ohio. Included with this letter you will find surveys for five people: 1) Health Commissioner (or Administrator), 2) Environmental Health Director, 3) Information Systems/Technology Administrator, and 4) Two Field Sanitarians. Would you and your staff please take the time to complete these surveys for me? If one or more of these positions are not filled, I would ask that the Health Commissioner or EH Director complete the survey for the unfilled position(s).

If you have ever embarked upon a project such as this you already know how critical it is to achieve a good response rate on surveys. These surveys comprise the core of my project – the very source of my data. I truly hope that you and your staff will take the time to complete the surveys and return them to me using any of the methods listed below. Please return the surveys to me by August 15, 2007. If you have any questions at all, please feel free to contact me by email or phone (below). Results of my CE project will be available on the Miami County Health District’s website in October 2007.

Thank you in advance for your help.

Kind regards,

Chris Cook, R.S.

Mail: Miami County Health District
Attn: Chris Cook
510 W. Water St. Suite 130
Troy, OH 45373

Email: chriscook@woh.rr.com or ccook@miamicountyhealth.net

Fax: 937-440-5466
Phone: 937-440-5472
SURVEY INSTRUCTIONS
for Health Commissioners

1. Distribute surveys to:
   Health Commissioner (Administrator)
   Environmental Health Director
   Information Systems/Technology Administrator
   Two Field Sanitarians – 1 water/sewage, 1 food

2. Request surveys be returned to you by August 13, 2007.

3. Collect completed surveys.

4. Send completed surveys back by August 15, 2007:

   Miami County Health District
   ATTN: Chris Cook
   510 W. Water St., Suite 130
   Troy, OH 45373
   OR
   chriscook@woh.rr.com or ccook@miamicountyhealth.net
   OR
   Fax: 937-440-5466
Appendix C: Health Commissioner Survey

Environmental Health Information Systems: More Than Just Gigabytes

Chris Cook, R.S.
Wright State University
Master of Public Health Program

Health Commissioner Survey

Here's what I am doing...
Surveying all 28 Local Health Districts in SW Ohio as part of my MPH program at Wright State University. I am attempting to...

1) Find and report on the state of information systems in southwest Ohio's environmental health practice,
2) Provide local health departments with baseline data about other public health agencies' use of information systems in southwest Ohio,
3) Aid local health departments in making informed decisions about the future of their information systems, and
4) Encourage leaders of the state and local health departments to communicate when implementing environmental health information systems.

Here's what I am asking you to do...
Help me complete my MPH! Please take the time to complete this survey. The data that I collect will become a part of my final project for my MPH. A great response rate on this survey will help me finish a beneficial project for Ohio's Environmental Health practice.

Here's what you need to know first...
What do I mean by "Environmental Health Information Systems (EHIS)?" The Public Health Data Standards Consortium defines EHIS as "the systematic application of information and computer science and technology to public health practices, research and learning. It is the efficient and effective organization and management of data, information and knowledge generated and used by public health professionals to fulfill the core functions of public health: assessment, policy and assurance." Ultimately, EHIS is the technology and data systems used in the practice of Environmental Health. For example, the program used to track food service inspections and generate new licenses every March 1st is a type of EHIS.

Here's the bottom line...
Please take the time to complete the survey. Upon completion, return the survey to the Health Commissioner/Administrator by August 13, 2007. Thanks in advance for your help!

Please do not include any personally identifiable information on the survey.

Chris Cook, R.S.
Environmental Health Information Systems: More than Just Gigabytes

Health Commissioner Survey

About You
1. Number of years with current Health Department: ________
2. Number of years of public health employment: ________
3. Professional certifications: __________________________________________
4. Highest college degree earned (and program): __________________________ (ie...MPH)
5. Do you have any technology, computer science, or information system background? (circle) Yes No
   If yes, explain: ______________________________________________________

Your Health Department
1. Type of Health Department: (circle) Combined General City Other:__________
2. Number of entire staff at Health Department: full-time _______ part-time _______
3. Average age of staff member: (estimate) _________________________________
4. Total number of population served by Health Department: _________________
5. Do you make rent or lease payments for your Health Department building? Yes No
6. Year your Health Department building was constructed: _________________
7. Number of years in your current building: ______________________________
8. Do you have a full-time Environmental Health Director? Yes No If part-time, hours per week: _____
9. Do you have a full-time Information Systems/Technology Administrator? Yes No
    If part-time, hours per week: ______

Health Department’s Finances
1. What is your annual budget for the entire Health Department? __________________________
2. What is your annual regular budget for Information Systems and Technology (this includes personnel)?
   Dollars: __________________________ AND Percentage of Entire Budget: __________________
3. How much of your Public Health Infrastructure Grant (PHIG) – if applicable – do you spend on Information
   Systems and Technology (this includes personnel)?
   Dollars: __________________________ AND Percentage of Entire PHIG: __________________

Check out the back!
Environmental Health Information Systems (EHIS)

1. Overall, how satisfied are you with your EHIS? (circle)
   
   Very Satisfied  Somewhat Satisfied  Not Satisfied At All
   10  9  8  7  6  5  4  3  2  1  0

2. How have you heard of or pursued EHIS for your Health Department? (check all that apply)
   
   Internet  Pre-made program from company
   Other Health Departments  State program
   Conferences  Magazines/journal articles
   Information Systems Administrator  Other:
   Designed in-house

3. How important are EHIS to you?
   
   Very Important  Somewhat Important  Not Important
   10  9  8  7  6  5  4  3  2  1  0

Guidance for Environmental Health Information Systems (EHIS)

1. Do you believe that the state (ODH, ODA, OEPA, etc) should take the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

   ____________________________________________________________

2. Do you believe that the state (ODH, ODA, OEPA, etc) has taken the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

   ____________________________________________________________

3. Do you believe that EHIS should integrate across jurisdictional boundaries? Is this important? Explain. (For example, is it important for county A to be able to seamlessly compare data to county B.)

   ____________________________________________________________

4. What are the top three things that you think EHIS should be able to do for your Health Department that would both be financially prudent and make a real difference in Environmental Health?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

5. What is your primary EHIS concern for 1) Your Health Department, 2) The State of Ohio?

   ____________________________________________________________
Appendix D: Environmental Health Director Survey

Environmental Health Information Systems: More Than Just Gigabytes

Chris Cook, R.S.
Wright State University
Master of Public Health Program

Here's what I am doing...

Surveying all 28 Local Health Districts in SW Ohio as part of my MPH program at Wright State University. I am attempting to...

1) Find and report on the state of information systems in southwest Ohio's environmental health practice,
2) Provide local health departments with baseline data about other public health agencies' use of information systems in southwest Ohio,
3) Aid local health departments in making informed decisions about the future of their information systems, and
4) Encourage leaders of the state and local health departments to communicate when implementing environmental health information systems.

Here's what I am asking you to do...

Help me complete my MPH! Please take the time to complete this survey. The data that I collect will become a part of my final project for my MPH. A great response rate on this survey will help me finish a beneficial project for Ohio's Environmental Health practice.

Here's what you need to know first...

What do I mean by "Environmental Health Information Systems (EHIS)?" The Public Health Data Standards Consortium defines EHIS as "the systematic application of information and computer science and technology to public health practices, research and learning. It is the efficient and effective organization and management of data, information and knowledge generated and used by public health professionals to fulfill the core functions of public health: assessment, policy and assurance." Ultimately, EHIS is the technology and data systems used in the practice of Environmental Health. For example, the program used to track food service inspections and generate new licenses every March 1st is a type of EHIS.

Here's the bottom line...

Please take the time to complete the survey. Upon completion, return the survey to the Health Commissioner/Administrator by August 13, 2007. Thanks in advance for your help!

Please do not include any personally identifiable information on the survey.

Chris Cook, R.S.
Environmental Health Information Systems: More than Just Gigabytes

About You
1. Number of years with current Health Department: __________
2. Number of years of public health employment: __________
3. Professional certifications: ____________________________________
4. Highest college degree earned (and program): _______________________(ie... MPH)
5. Do you have any technology, computer science, or information system background? (circle) Yes No
   If yes, explain: ____________________________________________

Your Environmental Health (EH) Department
1. Number of EH staff members: (includes support staff) full-time ______ part-time _______
2. Average age of EH staff member: (estimate) __________
3. Number of EH staff members with: their own computer __________ shared computer _______
4. Average number of hours per week an Information Systems Administrator spends in EH: _______
5. What is your total annual budget for the EH Department? __________________________________

Environmental Health Information Systems (EHIS)
1. Overall, how satisfied are you with your EHIS? (circle)
   Very Satisfied Somewhat Satisfied Not Satisfied At All
   10 9 8 7 6 5 4 3 2 1 0
2. How have you heard of or pursued EHIS for your EH Department? (check all that apply)
   Internet Pre-made program from company
   Other Health Departments State program
   Conferences Magazines/journal articles
   Information Systems Administrator Other:
   Designed in-house
3. How important are EHIS to you?
   Very Important Somewhat Important Not Important
   10 9 8 7 6 5 4 3 2 1 0
1. Overall, how would you rate the training you and your staff have received on all EHIS that you use?

   Excellent  Satisfactory  Poor
   10  9  8  7  6  5  4  3  2  1  0

2. Does your EH Department have a page on your Health Department's website? Yes No

   If yes, on average, how often is the EH page updated? ____________________________

Guidance for Environmental Health Information Systems (EHIS)

1. Do you believe that the state (ODH, ODA, OEPA, etc) should take the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

   ____________________________________________________________________________

2. Do you believe that the state (ODH, ODA, OEPA, etc) has taken the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

   ____________________________________________________________________________

3. Do you believe that EHIS should integrate across jurisdictional boundaries? Is this important? Explain. (For example, is it important for county A to be able to seamlessly compare data to county B.)

   ____________________________________________________________________________

4. What are the top three things that you think EHIS should be able to do for your EH Department that would both be financially prudent and make a real difference in Environmental Health?

   ____________________________________________________________________________

5. What is your primary EHIS concern for your EH Department?

   ____________________________________________________________________________

6. What advice would you share with other Health Departments that are "shopping" for EHIS?

   ____________________________________________________________________________

Just one more page...!
Your Environmental Health Information Systems (EHIS)

There are four (4) EH programs listed below. Please answer the questions for each program. If multiple EHIS are used for one program, please list and consider all EHIS used for the program (this excludes common applications such as Microsoft® Word for writing letters). Attach extra paper if necessary.

**Food Safety & Inspections**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Do you have EHIS in place for this program? Yes No If yes, how long has it been in place?</td>
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<td>What is the name of the EHIS and the designer?</td>
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<td>Why did you select this EHIS?</td>
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<td>Overall, how satisfied are you with this EHIS? (circle)</td>
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<td>Very Satisfied</td>
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<td>How would you rate the training you received for this EHIS?</td>
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<td>What does this EHIS do for you?</td>
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<td>What is your chief &quot;complaint&quot; about this EHIS?</td>
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<tr>
<td>What do you wish this EHIS could do for you and what could make it better?</td>
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**Public Health Nuisance**

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<td>Do you have EHIS in place for this program? Yes No If yes, how long has it been in place?</td>
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<td>What is the name of the EHIS and the designer?</td>
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<td>Why did you select this EHIS?</td>
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<td>Overall, how satisfied are you with this EHIS? (circle)</td>
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<td>How would you rate the training you received for this EHIS?</td>
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<td>What does this EHIS do for you?</td>
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<tr>
<td>What do you wish this EHIS could do for you and what could make it better?</td>
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</table>
Sewage Treatment Systems – Design/Installation (NEW systems)
Do you have EHIS in place for this program? Yes No If yes, how long has it been in place? ________
What is the name of the EHIS and the designer? ____________________________
Why did you select this EHIS? __________________________________________

Overall, how satisfied are you with this EHIS? (circle)

<table>
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<th>Very Satisfied</th>
<th>Somewhat Satisfied</th>
<th>Not Satisfied At All</th>
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How would you rate the training you received for this EHIS?

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<th>Satisfactory</th>
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What does this EHIS do for you? __________________________________________

What is your chief “complaint” about this EHIS? __________________________

What do you wish this EHIS could do for you and what could make it better? _____________________________________________________________

Sewage Treatment Systems – Operational Permit Program (EXISTING systems)
Do you have EHIS in place for this program? Yes No If yes, how long has it been in place? ________
What is the name of the EHIS and the designer? ____________________________
Why did you select this EHIS? __________________________________________

Overall, how satisfied are you with this EHIS? (circle)

<table>
<thead>
<tr>
<th>Very Satisfied</th>
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How would you rate the training you received for this EHIS?

<table>
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<th>Didn't Receive Training</th>
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<td>N/A</td>
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</tbody>
</table>

What does this EHIS do for you? __________________________________________

What is your chief “complaint” about this EHIS? __________________________

What do you wish this EHIS could do for you and what could make it better? _____________________________________________________________

BONUS!

Unless you have opted out of the Smoke-Free Workplace enforcement, you are using at least one EHIS. What do you think of the Ohio Department of Health’s new Smoke-Free Workplace Web Application (this is an EHIS)
Here's what I am doing...

Surveying all 28 Local Health Districts in SW Ohio as part of my MPH program at Wright State University. I am attempting to...

1) Find and report on the state of information systems in southwest Ohio's environmental health practice,
2) Provide local health departments with baseline data about other public health agencies' use of information systems in southwest Ohio,
3) Aid local health departments in making informed decisions about the future of their information systems, and
4) Encourage leaders of the state and local health departments to communicate when implementing environmental health information systems.

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Help me complete my MPH! Please take the time to complete this survey. The data that I collect will become a part of my final project for my MPH. A great response rate on this survey will help me finish a beneficial project for Ohio's Environmental Health practice.

Here's what you need to know first...

What do I mean by "Environmental Health Information Systems (EHIS)?" The Public Health Data Standards Consortium defines EHIS as "the systematic application of information and computer science and technology to public health practices, research and learning. It is the efficient and effective organization and management of data, information and knowledge generated and used by public health professionals to fulfill the core functions of public health: assessment, policy and assurance." Ultimately, EHIS is the technology and data systems used in the practice of Environmental Health. For example, the program used to track food service inspections and generate new licenses every March 1st is a type of EHIS.

Here's the bottom line...

Please take the time to complete the survey. Upon completion, return the survey to the Health Commissioner/Administrator by August 13, 2007. Thanks in advance for your help!
Environmental Health Information Systems: More than Just Gigabytes

Information Systems Administrator Survey

About You
1. Number of years with current Health Department: 
2. Number of years of public health employment: 
3. Professional certifications: 
4. Highest college degree earned (and program): (ie...BS)
5. Do you have any public health or environmental health background – other than working at the Health Department? (circle) Yes No If yes, explain:

Your Information Systems (IS) Department
1. Number of IS staff members (includes support staff): full-time _______ part-time _______
2. Average age of IS staff member: (estimate) _______________
3. Average number of hours per week IS staff members spend in Environmental Health: 
4. What is your total annual budget for the IS Department? 
5. Total number of Health Department staff members with internet access at their desk: 
6. Total number of active (in-use) computers in the Health Department: desktops _______ laptops _______
7. Total number of reserve (but usable) computers in the Health Department: desktops _______ laptops _______
8. Average year that in-use computers were purchased: desktops _______ laptops _______
9. Does your Health Department have a website? Yes No
   If yes, who maintains/updates the Health Department website? 
10. Do you use any open-source software in the Health Department? Yes No
    If yes, what software? 

Environmental Health Information Systems (EHIS)
1. Overall, how satisfied are you with EHIS used in the Environmental Health (EH) Department? (circle) 
   Very Satisfied 10 9 8 7 6 5 4 3 2 1 0 Not Satisfied At All
2. Does the EH Department have a page on your Health Department’s website? Yes No N/A
   If yes, on average, how often is the EH page updated? 

Check out the back!
1. How have you heard of or pursued EHIS for the EH Department? (check all that apply)
   - Internet
   - Pre-made program from company
   - Other Health Departments
   - State program
   - Conferences
   - Magazines/journal articles
   - Information Systems Administrator
   - Other:
   - Designed in-house

2. How important are EHIS to you? (circle)
   - Very Important
   - Somewhat Important
   - Not Important

3. Overall, how would you rate the training the EH staff has received on all EHIS that you use?
   - Excellent
   - Satisfactory
   - Poor

Guidance for Environmental Health Information Systems (EHIS)

1. Do you believe that the state (ODH, ODA, OEPA, etc) should take the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

2. Do you believe that the state (ODH, ODA, OEPA, etc) has taken the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

3. Do you believe that EHIS should integrate across jurisdictional boundaries? Is this important? Explain.
   (For example, is it important for county A to be able to seamlessly compare data to county B.)

4. What are the top three things that you think EHIS should be able to do for the EH Department that would both be financially prudent and make a real difference in Environmental Health?

5. What is your primary EHIS concern for the EH Department?

6. What advice would you share with other Health Departments that are "shopping" for EHIS?

Just one more page...!
Your Environmental Health Information Systems (EHIS)

There are four (4) EH programs listed below. Please answer the questions for each program. If multiple EHIS are used for one program, please list and consider all EHIS used for the program (this excludes common applications such as Microsoft® Word for writing letters). Attach extra paper if necessary.

---

**Food Safety & Inspections**

Do you have EHIS in place for this program?  Yes  No  If yes, how long has it been in place?  
What is the name of the EHIS and the designer?  
Why did you select this EHIS?  
Costs for this EHIS:  Startup?  Yearly Licensing/Maintenance?  
Overall, how satisfied are you with this EHIS? (circle)  
What does this EHIS do for the EH Department?  
What is your chief "complaint" about this EHIS?  
What do you wish this EHIS could do for the EH Department and what could make it better?  
---

**Public Health Nuisance**

Do you have EHIS in place for this program?  Yes  No  If yes, how long has it been in place?  
What is the name of the EHIS and the designer?  
Why did you select this EHIS?  
Costs for this EHIS:  Startup?  Yearly Licensing/Maintenance?  
Overall, how satisfied are you with this EHIS? (circle)  
What does this EHIS do for the EH Department?  
What is your chief "complaint" about this EHIS?  
What do you wish this EHIS could do for the EH Department and what could make it better?  
---

Check out the back!
Sewage Treatment Systems – Design/Installation (NEW systems)

Do you have EHIS in place for this program? Yes No If yes, how long has it been in place? _______

What is the name of the EHIS and the designer? ________________________________

Why did you select this EHIS? _____________________________________________

Costs for this EHIS: Startup? ________ Yearly Licensing/Maintenance? ________

Overall, how satisfied are you with this EHIS? (circle)

<table>
<thead>
<tr>
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</table>

What does this EHIS *do* for the EH Department? ___________________________________________

What is your chief “complaint” about this EHIS? ___________________________________________

What do you wish this EHIS *could do* for the EH Department and what could make it better? __________

Sewage Treatment Systems – Operational Permit Program (EXISTING systems)

Do you have EHIS in place for this program? Yes No If yes, how long has it been in place? _______

What is the name of the EHIS and the designer? ________________________________

Why did you select this EHIS? _____________________________________________

Costs for this EHIS: Startup? ________ Yearly Licensing/Maintenance? ________

Overall, how satisfied are you with this EHIS? (circle)

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What does this EHIS *do* for the EH Department? ___________________________________________

What is your chief “complaint” about this EHIS? ___________________________________________

What do you wish this EHIS *could do* for the EH Department and what could make it better? __________

BONUS!

Unless you have opted out of the Smoke-Free Workplace enforcement, you are using at least one EHIS. What do you think of the Ohio Department of Health’s new Smoke-Free Workplace Web Application (this is an EHIS)
Appendix F: Field Sanitarian (Sewage and Water Programs) Survey

Environmental Health Information Systems: More Than Just Gigabytes

Chris Cook, R.S.
Wright State University
Master of Public Health Program

Field Sanitarian Survey – Sewage/Water Programs

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Surveying all 28 Local Health Districts in SW Ohio as part of my MPH program at Wright State University. I am attempting to...

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Here’s the bottom line...

Please take the time to complete the survey. Upon completion, return the survey to the Health Commissioner/Administrator by August 13, 2007. Thanks in advance for your help!

Please do not include any personally identifiable information on the survey.

Chris Cook, R.S.
Environmental Health Information Systems: More than Just Gigabytes

Field Sanitarian Survey – Sewage/Water

About You
1. Number of years with current Health Department: ________________
2. Number of years of public health employment: ________________
3. Professional certifications: ____________________________________________
4. Highest college degree earned (and program): ____________________________ (ie...BS in EHS)
5. Do you have any technology, computer science, or information system background? (circle) Yes No
   If yes, explain: _______________________________________________________

Your Environmental Health (EH) Department
1. Number of hours per week (average) you spend working in each EH program (ie...Sewage, 30 hrs):
   Program: ___________________________ Hours per week: _________________
   Program: ___________________________ Hours per week: _________________
   Program: ___________________________ Hours per week: _________________
   Program: ___________________________ Hours per week: _________________
   Program: ___________________________ Hours per week: _________________

Environmental Health Information Systems (EHIS)
1. Overall, how satisfied are you with your EHIS? (circle)
   Very Satisfied Somewhat Satisfied Not Satisfied At All
   10 9 8 7 6 5 4 3 2 1 0
2. How have you heard of other EHIS? (check all that apply)
   Internet Pre-made program from company
   Other Health Departments State program
   Conferences Magazines/journal articles
   Information Systems Administrator Other: _________________________
   Designed in-house
3. How important are EHIS to you?
   Very Important Somewhat Important Not Important
   10 9 8 7 6 5 4 3 2 1 0

Check out the back!
1. Overall, how would you rate the training you have received on all EHIS that you use?

<table>
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<tr>
<th>Excellent</th>
<th>Satisfactory</th>
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<td>10</td>
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**Guidance for Environmental Health Information Systems (EHIS)**

1. Do you believe that the state (ODH, ODA, OEPA, etc) should take the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

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Your Environmental Health Information Systems (EHIS)

There are four (4) EH programs listed below. Please answer the questions for each program. If multiple EHIS are used for one program, please list and consider all EHIS used for the program (this excludes common applications such as Microsoft® Word for writing letters). If you never work in the program, write N/A next to it.

<table>
<thead>
<tr>
<th>Program</th>
<th>Do you have EHIS in place?</th>
<th>What is the name of the EHIS?</th>
<th>Overall, how satisfied are you with this EHIS?</th>
<th>How would you rate the training you received for this EHIS?</th>
<th>What does this EHIS do for you?</th>
<th>What is your chief &quot;complaint&quot; about this EHIS?</th>
<th>What do you wish this EHIS could do for you and what could make it better?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Safety &amp; Inspections</td>
<td>Yes</td>
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<td>Public Health Nuisance</td>
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</table>
Sewage Treatment Systems – Design/Installation (NEW systems)

Do you have EHIS in place for this program? Yes No

What is the name of the EHIS? ________________________________

Overall, how satisfied are you with this EHIS? (circle)

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<tr>
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<th>Somewhat Satisfied</th>
<th>Not Satisfied At All</th>
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<tbody>
<tr>
<td>10 9 8 7 6 5 4 3 2 1 0</td>
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</table>

How would you rate the training you received for this EHIS?

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Satisfactory</th>
<th>Poor</th>
<th>Didn't Receive Training</th>
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<tbody>
<tr>
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What does this EHIS do for you? ____________________________________________

What is your chief “complaint” about this EHIS?

What do you wish this EHIS could do for you and what could make it better?

Sewage Treatment Systems – Operational Permit Program (EXISTING systems)

Do you have EHIS in place for this program? Yes No

What is the name of the EHIS? ________________________________

Overall, how satisfied are you with this EHIS? (circle)

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What do you wish this EHIS could do for you and what could make it better?

BONUS!

Unless you have opted out of the Smoke-Free Workplace enforcement, you are using at least one EHIS. What do you think of the Ohio Department of Health’s new Smoke-Free Workplace Web Application (this is an EHIS)?
Appendix G: Field Sanitarian (Food Program) Survey

Environmental Health Information Systems: More Than Just Gigabytes
Chris Cook, R.S.
Wright State University
Master of Public Health Program

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Here's the bottom line...
Please take the time to complete the survey. Upon completion, return the survey to the Health Commissioner/Administrator by August 13, 2007. Thanks in advance for your help!

Please do not include any personally identifiable information on the survey.

Chris Cook, R.S.
Environmental Health Information Systems: More than Just Gigabytes

Field Sanitarian Survey - Food

About You
1. Number of years with current Health Department: ________________
2. Number of years of public health employment: ________________
3. Professional certifications: _____________________________________

4. Highest college degree earned (and program): ________________________ (ie...BS in EHS)
5. Do you have any technology, computer science, or information system background? (circle) Yes No
   If yes, explain: ____________________________________________________

Your Environmental Health (EH) Department
1. Number of hours per week (average) you spend working in each EH program (ie...Food Safety, 30 hrs):
   Program: ___________________________________ Hours per week: __________
   Program: ___________________________________ Hours per week: __________
   Program: ___________________________________ Hours per week: __________
   Program: ___________________________________ Hours per week: __________
   Program: ___________________________________ Hours per week: __________

Environmental Health Information Systems (EHIS)
1. Overall, how satisfied are you with your EHIS? (circle)
   Very Satisfied Somewhat Satisfied Not Satisfied At All
   10 9 8 7 6 5 4 3 2 1 0
2. How have you heard of other EHIS? (check all that apply)
   Internet
   Other Health Departments
   Conferences
   Information Systems Administrator
   Designed in-house
   Pre-made program from company
   State program
   Magazines/journal articles
   Other: ____________________________

3. How important are EHIS to you?
   Very Important Somewhat Important Not Important
   10 9 8 7 6 5 4 3 2 1 0

Check out the back!
1. Overall, how would you rate the training you have received on all EHIS that you use?

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<tr>
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</tbody>
</table>

Guidance for Environmental Health Information Systems (EHIS)

1. Do you believe that the state (ODH, ODA, OEPA, etc) should take the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

__________________________________________________________________________________

2. Do you believe that the state (ODH, ODA, OEPA, etc) has taken the lead for local Health Departments when deciding upon EHIS to be used for mandated programs? Explain.

__________________________________________________________________________________

3. Do you believe that EHIS should integrate across jurisdictional boundaries? Is this important? Explain. (For example, is it important for county A to be able to seamlessly compare data to county B.)

__________________________________________________________________________________

4. What are the top three things that you think EHIS should be able to do for you (and your EH Department) that would both be financially prudent and make a real difference in Environmental Health?

__________________________________________________________________________________

5. What is your primary EHIS concern for your EH Department?

__________________________________________________________________________________

6. What advice would you share with other Health Departments that are “shopping” for EHIS?

__________________________________________________________________________________

Just one more page...!
Your Environmental Health Information Systems (EHIS)

There are four (4) EH programs listed below. Please answer the questions for each program. If multiple EHIS are used for one program, please list and consider all EHIS used for the program (this excludes common applications such as Microsoft® Word for writing letters). If you never work in the program, write N/A next to it.

Food Safety & Inspections
Do you have EHIS in place for this program? Yes No
What is the name of the EHIS?

Overall, how satisfied are you with this EHIS? (circle)

<table>
<thead>
<tr>
<th>Very Satisfied</th>
<th>Somewhat Satisfied</th>
<th>Not Satisfied At All</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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<td>8</td>
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<tr>
<td>7</td>
<td>6</td>
<td>5</td>
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<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

How would you rate the training you received for this EHIS?

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Satisfactory</th>
<th>Poor</th>
<th>Didn’t Receive Training</th>
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<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

What does this EHIS do for you?

What is your chief “complaint” about this EHIS?

What do you wish this EHIS could do for you and what could make it better?

Public Health Nuisance
Do you have EHIS in place for this program? Yes No
What is the name of the EHIS?

Overall, how satisfied are you with this EHIS? (circle)

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</table>

What does this EHIS do for you?

What is your chief “complaint” about this EHIS?

What do you wish this EHIS could do for you and what could make it better?

Check out the back!
Sewage Treatment Systems – Design/Installation (NEW systems)

Do you have EHIS in place for this program?  Yes  No

What is the name of the EHIS? __________________________

Overall, how satisfied are you with this EHIS? (circle)

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<tr>
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<td>6 5 4</td>
<td>3 2 1 0</td>
</tr>
</tbody>
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<td></td>
</tr>
</tbody>
</table>

What does this EHIS do for you? __________________________

What is your chief “complaint” about this EHIS?______________________________

What do you wish this EHIS could do for you and what could make it better? ________________________________________________

Sewage Treatment Systems – Operational Permit Program (EXISTING systems)

Do you have EHIS in place for this program?  Yes  No

What is the name of the EHIS? __________________________

Overall, how satisfied are you with this EHIS? (circle)

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What does this EHIS do for you? __________________________

What is your chief “complaint” about this EHIS? ________________

What do you wish this EHIS could do for you and what could make it better? ________________________________________________

BONUS!

Unless you have opted out of the Smoke-Free Workplace enforcement, you are using at least one EHIS. What do you think of the Ohio Department of Health’s new Smoke-Free Workplace Web Application (this is an EHIS!)

- 67 -
DATE: July 13, 2007

TO: Chris Cooks, MPH Student
    Public Health, SOM
    Janet Rickabaugh, Ph.D., Fac. Adv.
    Community Health

FROM: B. Laurel Elder, Ph.D., Chair
      WSU Institutional Review Board

SUBJECT: SC# 3441
'Environmental Health Information Systems: More than Just Gigabytes'

At the recommendation of the Screening Committee, your study referenced above has been recommended for exemption. Please note that any change in the protocol must be approved by the IRB; otherwise approval is terminated.

This action will be referred to the Full Institutional Review Board for ratification at their next scheduled meeting.

NOTE: This approval will automatically terminate one (1) year after the above date unless you submit a "continuing review" request (see http://www.wright.edu/rsp/IRB/CR_sc.doc) to RSP.

If you have any questions or require additional information, please call me at 775-2425.

Thank you!

Enclosure
RESEARCH INVOLVING HUMAN SUBJECTS

ACTION OF THE WRIGHT STATE UNIVERSITY SCREENING COMMITTEE
Assurance Number: FWA00002427

Title: 'Environmental Health Information Systems: More than Just Gigabytes'

Principal Investigator: Chris Cooks, MPH Student
Public Health, SOM
Janet Rickabaugh, Ph.D., Fac. Adv.
Community Health

The Institutional Review Board Screening Committee Coordinator has approved an exemption with regard to the use of human subjects on this proposed project.

REMINDER: Federal regulations require prompt reporting to the IRB of any changes in research activity [changes in approved research during the approval period may not be initiated without IRB review (submission of an amendment), except where necessary to eliminate apparent immediate hazards to subjects] and prompt reporting of any serious or on-going problems, including unanticipated adverse reactions to biologicals, drugs, radioisotope labeled drugs or medical devices.

NOTE: This approval has been assigned an "SC" number in our system, which means the WSU Screening Committee concurs that this protocol is exempt under federal regulations.

Signed Chair, WSU-IRB

Chair, WSU-IRB
Approval Date: July 12, 2007
IRB Mtg. Date: August 20, 2007
Appendix I: Public Health Competencies Achieved

Domain 1: Analytic Assessment Skills
  o Identifies relevant and appropriate data and information sources.
  o Evaluates the integrity and comparability of data and identifies gaps in data sources.
  o Determines appropriate uses and limitations of both quantitative and qualitative data.
  o Makes relevant inferences from quantitative and qualitative data.
  o Applies data collection processes, information technology applications, and computer systems storage/retrieval strategies.

Domain 2: Policy Development/Program Planning Skills
  o Collects, summarizes, and interprets information relevant to an issue.

Domain 3: Communication Skills
  o Communicates effectively both in writing and orally, or in other ways.
  o Solicits input from individuals and organizations.
  o Advocates for public health programs and resources.
  o Effectively presents accurate demographic, statistical, programmatic, and scientific information for professional and lay audiences.

Domain 5: Community Dimensions of Practice Skills
  o Establishes and maintains linkages with key stakeholders.

Domain 6: Basic Public Health Sciences Skills
  o Identifies the individual's and organization's responsibilities within the context of the Essential Public Health Services and core functions.
  o Identifies the limitations of research and the importance of observations and interrelationships.

Domain 8: Leadership and Systems Thinking Skills
  o Helps create key values and shared vision and uses these principles to guide action.
  o Facilitates collaboration with internal and external groups to ensure participation of key stakeholders.
  o Contributes to development, implementation, and monitoring of organizational performance standards.

Public Health Competencies Source: http://trainingfinder.org/competencies/list_levels.htm